brightness." This ceases to be true when negative logarithms are involved. The yellow of the spectrum comes very near the colour of brightness. From these considerations a diagram has been constructed showing the colorific effects of mixing white with any part of the spectrum. The results of theory as shown by the diagram, closely accord with those of experiment upon the sensation of colour.

Prof. Rood also presented a paper on Newton's use of the term "Indigo" as a prismatic colour. It was intended to indicate the range of the spectrum between the blue and the blue-violet regions. The order of refrangibility is thus stated: prussian-blue and indigo; cobalt blue; genuine ultramarine blue; artificial ultramarine blue.

Prof. Joseph Le Conte, of California, sent a communication on the structure of the crystalline lens and its relations to periscopism. The discovery of Dr. Hermann, and his deductions therefrom, were first considered. These are that the crystalline lens, by its structure, is endowed with the property of forming distinct images of objects though lying on the extreme margins of the field of view, of forming perfect images on the retinal screen, even to the extreme anterior margins. Thus the eye has an enormous field of view compared with optical instruments. The purpose of the structure is to give periscopism to the eye. Prof. Le Conte believes, however, that as far as periscopism is concerned this structure is of little if any value in man for want of a corresponding suitable retinal structure. The indistinctness of the retinal image is different from the indistinctness of an imperfect perception of the image, the former being due to the properties of the lens, the latter to the organisation of the retina. In proportion as we go upward in the scale of animal life we find the powers of the central spot of the optical apparatus more thoroughly developed for the purposes of binocular vision.

Prof. A. Mayer, of Stevens Institute, presented four communications. He described a "Vernier microscope," which he believes to be new. The object is to substitute an accurate and permanent scale cut on glass for the varying errors of a micrometer screw. The instrument is of small cost and its errors are not varying. On a glass plate a series of lines is cut in tenths of millimetres; the central millimetre is divided into ten parts. This scale slides in carefully wrought guides in front of the objective of a firmly fixed microscope. In the focus is another scale so adjusted that ten of its parts accurately subtend the image of $\frac{9}{100}$ths of the millimetre scale. Thus a Vernier is formed which reads down to the $\frac{1}{1000}$th of a millimetre. The glass slide is so shaped that its rounded conical end abuts against the object to be measured. Readings to the full capacity of the instrument can be quickly obtained.

Prof. Mayer described his apparatus for measuring the expansion of metals and alloys under differences of temperature. It is believed that the coefficients of expansion, now inaccurately known, will be more correctly ascertained by this research.

The vibrations of tuning-forks received further investigation by Prof. Mayer; the cost of inquiry was defrayed by the Bache fund. The probable error in these determinations is the $\frac{1}{100}$ of one vibration, *i.e.*, with 256 vibrations to a second the probable error is $\frac{1}{25600}$ of a second. Differences in amplitude of vibration make no difference in the vibratory period of the fork; pressure applied to the fork also has no effect on the vibratory period, though it shortens the continuance of the note.

Prof. Mayer also described his investigations into the distribution of magnetism in long bar magnets. Some of these bars which were tested were five feet in length. Various methods have been tried for ascertaining the facts of magnetic distribution; Prof. Mayer gave due credit to other workers in this field, and described their experiments.

The Academy will hold its semi-annual meeting next autumn at New York.

NOTES

THE following is a list of the officers of the forty-seventh annual meeting of the British Association which will, as we have intimated, commence at Plymouth on Wednesday, August 15:—President Elect—Prof. Allen Thomson, M.D., LL.D., F.R.S., F.R.S.E. Vice-Presidents Elect—The Right Hon. the Earl of Mount-Edgcumbe, D.C.L., the Right Hon. Lord Blachford, K.C.M.G., Dr. William Spottiswoode, F.R.S., Dr. William Froude, C.E., F.R.S., Mr. Charles Spence Bate, F.R.S. General Secretaries—Capt. Douglas Galton, C.B., F.R.S., Dr. Philip Lutley Sclater, F.R.S. Assistant General Secretary—George Griffith, M.A., F.C.S. General Treasurer—Prof. A. W. Williamson, F.R.S. Local Secretaries—Messrs. William Adams, William Square, F.R.C.S., Hamilton Whitefore. Local Treasurer—Mr. Francis Hicks. The Presidents of the Sections are as follow:—Section A: Mathematical and Physical Science—President, Prof. G. C. Foster, F.R.S. Section B: Chemical Science—President, F. A. Abel, F.R.S. Section C: Geology—President, W. Pengelly, F.R.S. Section D: Biology—President, J. Gwyn Jeffreys, F.R.S., F.L.S. Department of Zoology and Botany, J. Gwyn Jeffreys, F.R.S., F.L.S. (President), will preside. Department of Anatomy and Physiology, Prof. Macalister, M.D. (Vice-President), will preside. Department of Anthropology, Sir Walter Elliot, K.C.S.I., F.L.S. (Vice-President), will preside. Section E: Geography—President, Admiral Ommanney, F.R.S., F.R.G.S. Section F: Economic Science and Statistics—President, the Right Hon. the Earl of Fortescue. Section G: Mechanical Science—President, Edward Woods, C.E. The reception room will be opened on Monday, August 13, at 1 P.M., and on the following days at 8 A.M., for the issue of tickets to members, associates, and ladies, and for supplying information. No tickets will be issued after 6 P.M. The first general meeting will be held on Wednesday, August 15, at 8 P.M., when Prof. Andrews, F.R.S., will resign the chair, and Prof. Allen Thomson, F.R.S., President Elect, will assume the Presidency, and deliver an Address. On Thursday evening, August 16, at 8 A.M., a *soirée*; on Friday evening, August 17, at 8.30 P.M., a Discourse by Prof. Warington Smyth, M.A., F.R.S., on the Physical Phenomena connected with the Mines of Cornwall and Devon; on Monday evening, August 20, at 8.30 P.M., a Discourse, but by whom not yet arranged; on Tuesday evening, August 21, at 8 P.M, a *soirée*; on Wednesday, August 22, the Concluding General Meeting will be held at 2.30 P.M. The local arrangements for the Plymouth meeting are not yet matured, but we believe they will include an exhibition of paintings chiefly by artists of Devon and Cornwall, including magnificent examples of Reynolds, Opie, Eastlake, Northcote, Cooke, Prout, &c. There will be excursions to Torquay or Kent's Hole, &c., and the Dart; up the Tamar or Cotehole; to the Moss Clayworks and over Dartmoor; to the Eddystone Breakwater and Government establishments; to the Caradoc mines; and to Penzance, the Lizard, the Land's End, &c.

A RECEPTION was held by the President of the Royal Society and Lady Hooker at Burlington House, on Wednesday evening June 13, which was largely attended. The invitations included ladies as well as men of science. The rooms were decorated with plants, and there was a collection of instruments and objects of scientific interest. Among the novelties were new spectroscopic instruments exhibited by Mr. Browning and Mr. Hilger; and Messrs. Tisley and Spiller's harmonograph curves, drawn on smoked glass.

A CONGRESS on Domestic Economy, organised by the Society of Arts, is to be held in Birmingham on July 18 and 19. Section A is to include (1) Needlework; (2) Cleanliness; (3) Food and Cookery; (4) Household Expenditure; (5) Thrift. Section B (6), Health; (7) Sickness; (8) The Dwelling; (9) Warming and Ventilation. Section C (10), Teaching the Subjects in Elementary Schools; (11) Text-books; (12) Inspection and Government Grants; (13) Importance of Female Inspectors; (14) Examinations. A number of papers are already promised, among them being papers by Mrs. W. E. Gladstone and Prof. Huxley. The Local Committee includes the Lords-Lieutenant of Staffordshire, Warwickshire, and Worcestershire, the Bishop of Worcester, several noblemen, clergymen, the Mayor of Birmingham, &c.

The Helvetic Society of Natural Sciences meets this year at Bex, in Canton Vaud, from August 19 to 27. Several interesting excursions have already been arranged for. Prof. Louis Dufour, of Lausanne, will be president. English naturalists will be heartily welcomed.

The death is announced of Lieut.-Gen. Sir Henry James, director of the Ordnance Survey of Great Britain from 1854, until his appointment to the command of a battalion of Royal Engineers in 1874, since which he has lived in Southampton in failing health. He was seventy-four years old, and from 1844, when he was director of the Geological Survey in Ireland, had written on various scientific subjects.

Some bones of *Lithornis emuinus*, an enormous bird of the eocene period, have just been discovered in the London clay at Sheppy by Mr. W. H. Shrubsole, of Sheerness-on-Sea. Casts of these fossils will be taken for the British Museum.

The well-known traveller, Dr. Schweinfurth, has recently returned to Egypt from a two months' journey through the Arabian desert, richly laden with scientific collections. He proceeds to Berlin to complete the arrangement of the large quantities of botanical specimens collected by him in his late expeditions.

No. 4 of the *Quarterly Bulletin* of the Cairo Society of Geography contains a valuable account, by Dr. Nachtigal, of his visit to Wadai, as the country between Darfur and Bagirmi is called, and notes on the country of Harrar, by Mohammed Maktar. The same Society has published separately an obituary notice of the late Marquis de Compiègne, by M. C. Guillemine.

A valuable and somewhat elaborate geographical sketch of Loango and the Loango Coast, by Dr. Pechuel Lösche, has been published in a separate form from the *Mittheilungen* of the Leipzig Geographical Society.

The Annual Report for 1876-7, of the West London Scientific Association, speaks favourably of the progress of that Association, which now numbers 186 members.

In the Buenos Ayres *Standard* of May 13 D. Francisco Moreno describes a journey he made up the Santa Cruz river, in Southern Patagonia, in about the 50th deg. of S. lat. Notwithstanding the great rapidity of the current, he succeeded, with three sailors, in ascending the river, taking thirty days to it. The Santa Cruz issues from a fine lake thirty miles long and ten broad, in S. lat. 50° 14′ 22″ and 71° 59′ W. long. D. Moreno was the first to sail along this lake, which he explored and sketched pretty thoroughly, making considerable geological collections in the neighbourhood both of this and of other lakes in the same region. Amongst these was Lake Biedma, in the neighbourhood of the still active volcano, Chalten. A river more than 200 yards wide connects Lake Biedma with Lake Santa Cruz.

Mr. G. Brown Goode, assistant curator of the National Museum at Washington, has been engaged during the past winter in investigating the natural history of the Bermudas, and has recently returned with a large collection, filling twelve barrels and forty-three boxes, and including over 1,000 bottles of invertebratas in alcohol. His collections embrace the entire marine fauna of the coast—fishes, molluscs, worms, &c., many of which are believed to be entirely new to science.

Mr. Robert Lowe, M.P., presided on Wednesday, last week, at a meeting of the committee formed for the purpose of organising a testimonial to Mr. John Simon, F.R.S., late medical officer to the Privy Council and Local Government Board, in recognition of the long and valuable labours he has rendered to the State, and of his eminent services to sanitary science. It is proposed that the testimonial shall assume the form of a bust in marble of Mr. Simon for presentation to the Royal College of Surgeons, agreeably to the wishes of the Council of that body. The cost, together with the expenses, will probably amount to 500*l.* We are sure that not only members of the medical profession, but all who are interested in sanitary science, will willingly contribute to a monument to one who has done so much for that science.

A special direction of science and arts has been added to the French Ministry of Public Instruction. M. Walteville has been appointed to the new office, and it is supposed that having nothing to do with politics, he may continue in office irrespective of any change in the Ministry. It would be well to insure a continuity of action and professional independence to the head of so useful an administration.

A new photographic department has been established in France for the reproduction of scientific or artistic objects. The laboratory will be kept up exclusively by Government. The State photograpers will be required to employ the most advanced methods and to work for the improvement of the art.

On Friday night a series of interesting experiments with the Jablochkoff electric light took place at the West India Docks, under the direction of M. Denayrouze. The apparatus used for the occasion consisted merely of an electro-magnetic machine worked by a small steam-engine, some insulated wires, and the electric candles, which are the invention of M. Jablochkoff, and composed, as we have already described, of two carbons placed side by side with a slip of insulating substance between them, which burns away with the carbon exactly in the same way as the wax of a wax candle is consumed with the wick. The first experiment in order to show the suitableness of the invention for dock purposes consisted in the lighting of four of the "candles" in a large yard. The light thus obtained, which was shaded by ground glass, brilliantly illuminated the inclosure, it being possible to read small print at a considerable distance from the lights, while at the same time the eyes were not affected by the glare, as is the case with the ordinary electric light. The second experiment was confined to the illumination of the top story of one of the large warehouses, and this, like its predecessor, was equally successful. A large vessel at the quay side was also lighted up, as also was a portion of the quay. The whole of the experiments were very successful, and it was stated that each "candle" gave a light equal to 100 gas lights. The light is said to be much less expensive than gas.

The Leicester Literary and Philosophical Society have commenced the publication of its *Transactions* from its foundation in 1835, as far as material for these can now be obtained. We have received the first two parts of this publication, extending from 1835 to 1841; they contain much likely to interest not only the members of the Leicester Society, but all who take an interest in the progress of local societies, now becoming so widespread and efficient.

Some experimental researches on the light refraction of a number of gases are described by M. Mascart in the *Annales Scientifiques*. A beam of light was sent through a collimator to two plates of plate-glass connected together at right angles; the halves of the beam were bent right and left by refraction through the glass. They then went parallel through two copper tubes containing the gases, and after refraction by a second system of glass plates placed in reverse directions, the halves were united again, and the beam passed through a slit to a system of prisms, then to a telescope. If the pressure in one copper tube were as varied, the phases of the two parts of the beam were unlike, and from the number of fringes, the refraction of the gas could be determined. The influence of pressure was examined, then the refractive power for different wave-lengths, then the influence of temperature; and the absolute refractive power deduced from the various factors obtained. The numbers for the latter range from 0·1387 (hydrogen), and 0·2706 (oxygen) to 0·7036 (sulphurous acid), and 0·8216 (cyanogen). The refraction of a gas mixture is equal to the sum of the refractions of the mixed gases. But the refraction of a compound is in general greater than that of a mixture of the simple gases composing it.

As determinations of longitude increase an ever-increasing number of control determinations are obtained. The number of the latter in Germany and Austria is now such that M. Albrecht has considered an attempt at equalisation of the system might prove advantageous, as at least an opinion might be formed regarding the degree of accuracy of the differences of longitude directly measured, and attention would be called to the weak parts of the system. He has accordingly, with M. Sadebeck, attempted an equalisation of the system of longitude determinations between the following stations:—Strassburg, Paris, Mannheim, Bonn, Leiden, Göttingen, Brocken, Leipzic, Berlin, Vienna, Munich, and Bregenz. An account of the investigation appears in *Astronomische Nachrichten*, No. 2,132. A numerical value is assigned to the various determinations, which extend over the last fifteen years; and this was necessarily, of course, somewhat arbitrary in character. In a table M. Albrecht gives for each pair of places the difference of longitude as calculated and the difference observed, and then the difference between the two. The greatest improvements are obtained in the determinations for Leipzig-Vienna and Berlin-Vienna (the difference for the former being + 0·136s., and for the latter 0·102s.) In the former case, there was some uncertainty as to the personal equation, and in the latter two weak currents had been operated with. The improvements are, of course, only approximate, and the certainty of the individual improvements obtained is considerable only when numerous control-determinations are to hand. The result sufficiently shows that a very large number of control-determinations, and an extensive establishment of the system is necessary to remove all doubt with regard to the relative position of the various stations.

As an illustration of the rapid growth of the now celebrated *Eucalyptus globulus*, we may mention that in the more elevated parts of Jamaica trees now exist about sixty feet high, the trunks of which measure a foot in diameter near the ground. These trees have been raised from seed introduced to the island about six years ago. It is proved that in the lowland districts the tree does not thrive, thus upsetting its suitability for regions in which it was at one time specially advocated.

THE new *Journal of Forestry*, the first number of which appeared on May 1, seems to have made a good start, judging from the contents of the two numbers that have now been issued. The contents are sufficiently varied to make the journal welcome to all in any way interested in forests or forest produce, both practically and scientifically, for we find not only articles on forest work for the month, but also a brief *résumé* of Mr. Thiselton Dyer's recent address on "Plant Growth" at the London Institution.

THE additions to the Zoological Society's Gardens during the past week include two Condor Vultures (*Sarcorhamphus gryphus*), a Chilian Sea Eagle (*Geranoaëtus melanolencus*) from South America, presented by Mr. John T. North; two Chaus Cats (*Felis chaus*) from North Africa, presented by Capt. W. Renney; a Crested Guan (*Penelope cristata*) from South America, presented by Mr. Daniel Miron; a Green-winged Trumpeter (*Psophia viridis*) from Brazil, a Common Trumpeter (*Psophia crepitans*), a Demeraran Cock of the Rock (*Rupicola crocea*) from Demerara, a Black-necked Stilt (*Himantopus nigricollis*), a Sun Bittern (*Eurypyga helias*), two Orinoco Geese (*Chenalopex jubata*), a Capybara (*Hydrochœrus capybara*) from South America, a Moor Monkey (*Semnopithecus maurus*) from Java, purchased; six Chilian Pintails (*Dafila spinicauda*), seven Summer Ducks (*Aix sponsa*), bred in the Gardens.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—An examination will begin on October 2 for the purpose of electing to a Physical Science Postmastership at Merton College. The postmastership is of the annual value of 80*l*. for five years, to be raised after two years, at the recommendation of the tutors, to 100*l*. The subjects of examination will be chemistry and physics; there will be a practical examination in chemistry, and candidates will have opportunities of giving evidence of a knowledge of biology. Further information from the tutor in physical science.

There will be an examination on October 11 for electing to a Natural Science Scholarship at Exeter College. The scholarship is of the annual value of 80*l*. for four years, without any limit of age. The examination will be in biology, chemistry, and physics, and candidates will be expected to show proficiency in at least two of these subjects. The examination will be to a large extent practical, but special weight will be given to a knowledge of general principles. Further information may be obtained from the Natural Science Lecturer, Prof. E. Ray Lankester.

Mr. M. J. Jackson, of University College, London, has been elected to the vacant (Holmes) Scholarship in Natural Sciences at St. John's College. The scholarship is of the annual value of 100*l*. for five years.

MANCHESTER.—Prof. Boyd Dawkins, F.R.S., has just completed his course of Field Lectures on Geology, at Owens College. Upwards of forty students—the large majority of whom were other than regular students of the College—availed themselves this year of the opportunity offered for acquiring some practical knowledge of geology. Excursions were made to the mountain limestone of Derbyshire, the coal measures near Oldham, the Permian rocks of Alderley Edge, where the copper veins disseminated throughout the sandstone were studied, and where traces of prehistoric man, in the shape of a few flint implements, were discovered. During Whit week Oxford was visited, and the Oolitic beds of the neighbourhood were explored.

During the session which has just closed, 100 students have worked in the chemical laboratories of Owens College, while the number of students attending the various courses of chemical lectures has amounted to about 200. Over a dozen original communications have proceeded from the chemical department during the session.

TAUNTON COLLEGE SCHOOL.—An address of sympathy with, and confidence in, the Rev. W. Tuckwell, head-master of the Taunton College School, is published in the local and educational papers, with the signatures of nearly all the parents. It appears that the school is heavily in debt, and that the numbers, chiefly through an attack of fever, have fallen below the paying point. The panic-stricken officials have selected the head-master as a scapegoat, attribute the loss in numbers to his "unpopularity," and are endeavouring to drive him to resign, a movement against which the parents protest in very animated terms. The part taken by this school and its head-master in working out and popularising the systematic teaching of science in company with the old-fashioned classical curriculum impels us to record these facts, and to look with interest for the result of this latest struggle between Philistinism and culture.

UNIVERSITY COLLEGE OF WALES.—A Welsh gentleman engaged in business in London, in addition to sums of 250*l*., 2,500*l*., and 1,100*l*. (the last sum in conjunction with his brother) previously subscribed, has just placed in the hands of the Council of the University College of Wales, a sum of money to be used in promoting scientific agriculture in Wales. According to a circular just issued, "one of the means proposed to be adopted in furtherance of this object is the delivery of courses of lectures free of charge to persons engaged in tuition in Wales, whereby they may be qualified for giving elementary instruction